

CLAIMS

1. An external cavity type semiconductor laser, comprising:

a semiconductor laser device having a plurality of layers including an activation layer;

a window glass disposed opposite to a beam emission surface of the semiconductor laser device;

a grating that receives a beam emitted from the semiconductor laser device through the window glass and returns a beam having a predetermined wavelength to the semiconductor laser device; and

a lens disposed between the semiconductor laser device and the grating and collects the beam emitted from the semiconductor laser device,

wherein the window glass is arranged in a first state or a second state, in the first state the window glass is in parallel with a first axis nearly perpendicular to a surface that is in parallel with at least one of boundary surfaces of the activation layer and other layers of the semiconductor laser device, the window glass being nearly in parallel with at least one of the boundary surfaces of the activation layer and the other layers of the semiconductor laser device, the window glass being nearly in parallel with the beam emission surface of the semiconductor laser device, the window glass being not in parallel with a second axis perpendicular to the first axis, in the second state

the window glass is not in parallel with the first axis,
the window glass being nearly in parallel with the
second axis.

2. The external cavity type semiconductor laser
as set forth in claim 1,

wherein the window glass is arranged in the
first state, and

wherein an angle between a surface of the
window glass and the second axis is in the range from
5° to 12°.

3. The external cavity type semiconductor laser
as set forth in claim 1,

wherein the window glass is arranged in the
second state, and

wherein the angle between the surface of the
window glass and the first axis is in the range from 1°
to 1.6°.

4. The external cavity type semiconductor laser
as set forth in claim 1,

wherein the semiconductor laser device and
the grating are arranged so that the semiconductor
laser device supplies an S wave to the grating.

5. The external cavity type semiconductor laser
as set forth in claim 1,

wherein the semiconductor laser device has an
output power of at least 45 mW, and

wherein when the semiconductor laser device

emits a beam with an output power of 45 mW or less, a kink does not occur.

6. The external cavity type semiconductor laser as set forth in claim 5,

5 wherein the semiconductor laser device is a laser diode,

wherein side surfaces of a ridge of the laser diode are buried with two layers of an insulation film to suppress the kink and a stripe width W is 1.6 μm or less.

10 7. The external cavity type semiconductor laser as set forth in claim 1,

wherein the semiconductor laser device is a laser diode, and

15 wherein a reflectance of a beam emission surface of the laser diode is 3 % or less.

8. The external cavity type semiconductor laser as set forth in claim 1,

20 wherein a numerical aperture of the lens is in the range from 0.3 to 0.7.

9. The external cavity type semiconductor laser as set forth in claim 1,

wherein an external cavity length is in the range from 10 mm to 30 mm.

25 10. The external cavity type semiconductor laser as set forth in claim 9,

wherein the external cavity length is in the

range from 10 mm to 20 mm.

11. The external cavity type semiconductor laser as set forth in claim 1,

wherein a reflectance of a first order diffracted beam of the grating is in the range from 10 % to 30 %.

12. The external cavity type semiconductor laser as set forth in claim 1,

wherein the semiconductor laser device is a blue laser diode.

13. An external cavity type semiconductor laser, comprising:

a laser diode having a plurality of layers including an activation layer;

a window glass disposed opposite to a beam emission surface of the laser diode;

a grating that receives a beam emitted from the laser diode through the window glass and returns a beam having a predetermined wavelength to the laser diode; and

a lens disposed between the laser diode and the grating and collects the beam emitted from the laser diode,

wherein the window glass is arranged in a first state or a second state, in the first state the window glass is in parallel with a first axis nearly perpendicular to a surface that is in parallel with at

least one of boundary surfaces of the activation layer and other layers of the laser diode, the window glass being nearly in parallel with at least one of the boundary surfaces of the activation layer and the other layers of the laser diode, the window glass being nearly in parallel with the beam emission surface of the laser diode, the window glass being not in parallel with a second axis perpendicular to the first axis, in the second state the window glass is not in parallel with the first axis, the window glass being nearly in parallel with the second axis,

wherein the laser diode and the grating are arranged so that the laser diode supplies an S wave to the grating,

wherein the laser diode has an output power of at least 45 mW,

wherein when the laser diode emits a beam with an output power of 45 mW or less, a kink does not occur,

wherein a reflectance of a beam emission surface of the laser diode is 3 % or less,

wherein a numerical aperture of the lens is in the range from 0.3 to 0.7,

wherein an external cavity length is in the range from 10 mm to 30 mm, and

wherein a reflectance of a first order diffracted beam of the grating is in the range from

10 % to 30 %.

14. The external cavity type semiconductor laser
as set forth in claim 13,

wherein the laser diode is a blue laser diode.

5 15. The external cavity type semiconductor laser
as set forth in claim 13,

wherein the window glass is arranged in the
first state, and

10 wherein an angle between a surface of the
window glass and the second axis is in the range from
5° to 12°.

16. The external cavity type semiconductor laser
as set forth in claim 13,

15 wherein the window glass is arranged in the
second state, and

wherein the angle between the surface of the
window glass and the first axis is in the range from 1°
to 1.6°.

17. The external cavity type semiconductor laser
20 as set forth in claim 13,

wherein side surfaces of a ridge of the laser
diode are buried with two layers of an insulation film
to suppress the kink and a stripe width W is 1.6 μm or
less.

25 18. The external cavity type semiconductor laser
as set forth in claim 13,

wherein the external cavity length is in the

range from 10 mm to 20 mm.